

thing in photography. It is, in the case of eye-observation, a fact that you could positively have a telescope too big for the eye to use, but any increase that is at present possible in the reflector would only add to its photographic power.

The optical arrangements of the reflector are so varied that I propose to treat of them in detail for the purpose of indicating the most suitable. A. AINSLIE COMMON

### NOTES

THE following is the list of officers, &c., to be proposed at the anniversary meeting of the Royal Society, December 1, 1884:—President, Prof. Thomas Henry Huxley, LL.D. Treasurer, John Evans, D.C.L., LL.D. Secretaries: Prof. George Gabriel Stokes, M.A., D.C.L., LL.D., Prof. Michael Foster, M.A., M.D. Foreign Secretary, Prof. Alexander William Williamson, LL.D. Other Members of the Council: Capt. W. de Wiveleslie Abney, R.E., William Henry M. Christie, Astronomer-Royal, Prof. George H. Darwin, M.A., F.R.A.S., Warren De La Rue, M.A., D.C.L., Robert Etheridge, F.R.S.E., F.G.S., Sir Frederick J. O. Evans, K.C.B., Prof. William Henry Flower, LL.D., Prof. George Carey Foster, B.A., Sir Joseph D. Hooker, K.C.S.I., Prof. Henry N. Mosley, M.A., F.L.S., Hugo Müller, Ph.D., Capt. Andrew Noble, R.A., C.B., Lord Rayleigh, D.C.L., Prof. J. S. Burdon Sanderson, LL.D., Lieut.-Gen. R. Strachey, R.E., C.S.I., Prof. J. J. Sylvester, M.A., D.C.L., LL.D.

PROF. LIVERSIDGE, of the Sydney University, sends to the local press a suggestive communication in connection with the recent meeting of the British Association in Montreal, and the invitation forwarded by the Victorian Premier to visit Melbourne next year. Feeling how insurmountable for the present are the obstacles to such a visit, the writer proposes what appears to be a very wise alternative. Instead of looking forward to a near visit from the Association, he suggests, as a preliminary step, a federation of the various scientific societies in Australia, Tasmania, and New Zealand into an Australasian Association for the Advancement of Science on the lines of the British Association. A first meeting of the new Association might be held in Sydney on the hundredth anniversary of the colony, which with the combined attractions of an International Exhibition might induce a fair number of scientific visitors from England to take part in the proceedings. After the first meeting gatherings could take place annually, or every two or three years, as might be agreed upon by the members, in various parts of Australasia. The writer concludes with the remark, which few will gainsay, that such an Association would tend greatly to advance the sciences in the colonies, and in many ways materially favour their progress elsewhere.

ACCORDING to *Science*, Prof. E. S. Holden, Director of the Washburn Observatory of the University of Wisconsin, has lately collected all the data available for the discussion of the law of distribution of the fixed stars, so far as this is determinable from the method of star-gauging. The data were collected from a comparison with the results of a series of star-gauges in progress with the 15-inch equatorial of the Washburn Observatory; and they included (1) the 683 previously published gauges of Sir W. Herschel, with the places brought down from 1690 to 1860; (2) the 405 unpublished gauges of Sir W. Herschel, extracted from his observing-books, and generously placed at Prof. Holden's disposal by Lieut.-Col. John Herschel (these also reduced to 1860); (3) 500 counts of stars from the published charts of Dr. C. H. F. Peters; (4) 983 counts of stars from the unpublished charts of Dr. Peters, from the Paris charts as revised by him, and from the unpublished ecliptic charts of Prof. Watson; (5) 856 counts of stars from the unpublished and published charts of Dr. J.

Palisa. These, with the data from Sir J. Herschel's 605 southern gauges, and Celoria's *Durchmusterung* of the stars between 0° and + 6°, complete the very valuable collection of data which Prof. Holden has brought together in convenient tabular form, and from which one of his most important conclusions is, that the method of star-gauging must be applied to the study of comparatively small regions, and that the results from these are then to be combined into larger groups. Prof. Holden hopes that these tables may serve the valuable end of finally disposing of the fundamental assumption that the stars are equally scattered in space, and may bring about the study of their distribution on a more general basis.

THE Boston Society of Natural History have adopted a policy with regard to their library which, if generally followed, would make scientific libraries more generally useful. The Society send such books as can be replaced to students in any part of the country. The receivers of course pay the cost of carriage, and, in addition, strangers are required to deposit a sum equal to twice the market-value of the books so lent, as a guarantee against loss.

A BUREAU of scientific information has been formed in Philadelphia, composed of officers and members of the Academy of Science, whose duty shall be the imparting, through correspondence, of precise and definite information upon the different departments of science. The organisation is purely voluntary. The Secretary is Prof. Angelo Heilprin, of the Academy of Science.

THE new buildings of the Central School at Paris were opened last week by M. Rouvier, the new Minister of Commerce and Agriculture. A number of speeches were delivered on the occasion, from which we learn that as many as 5000 French engineers owe their training to this institution since its foundation fifty years ago by the late M. Dumas and others. The object contemplated by the erection of this institution was to check the predominatingly theoretical character of the instruction imparted by the Government schools and to remodel the engineering education in France according to the English standard. About ten years ago the establishment was purchased by the Government, but the teachers have held as closely as possible to the lines on which its teaching was originally laid down.

MR. STANFORD, of Charing Cross, has issued a reprint of the paper on the Ethnology of Egyptian Sudan, contributed by Prof. A. H. Keane to the November number of the *Journal* of the Anthropological Institute. This monograph, which will be welcome to all interested in the eventful drama now in progress in the Nile Valley, contains a summary but comprehensive survey of all the races between Egypt and the Equator, which are grouped in five main divisions: Bantu, Negro, Nubian, Semitic, and Hamitic. Much light is thrown on the obscure relations of these peoples to each other, and a clear picture presented to the reader of the manifold ethnical conditions in those regions. The tabulated schemes of all the Sudanese races with their numerous subdivisions, seem to be very complete, and will help to a better understanding of the reports daily received from the scene of the operations undertaken for the relief of Gen. Gordon and the Egyptian garrisons in the Sudan.

THE first annual meeting of the New England Meteorological Society was held in Boston on the 21st ult. The papers read were:—On rain-gauges, by Mr. Fitzgerald; rainfall maps, by Mr. Davis; weather observers in New England, by Prof. Upton; the establishment of a meteorological station on Blue Hill, Mass., by Mr. Rotch.

WITH reference to our recent note to the effect that Prof. Hugo Gylden, Director of the Stockholm Observatory, had

accepted a professorship at the Göttingen University, we are informed that the celebrated astronomer will, in consequence of the generous offer made to him by the King of Sweden, remain in his native country.

PROF. F. E. NIPHER finds, according to *Science*, from data taken from Dr. Engelmann's observations at St. Louis, Mo., lasting over a period of forty-seven years, that the duration of maximum rains is inversely proportional to the violence, or that the product of violence into duration is constant. This constant is the amount of water which may fall in a continuous rain, and is, for Dr. Engelmann's series of half a century, about 5 inches. A rain of 5 inches per hour may last one hour. A rain of 4 inches per hour may last an hour and a quarter; and such a rain Dr. Engelmann observed. A rain of  $2\frac{1}{2}$  inches per hour may last two hours, and several such rains were observed. A rain of 1 inch per hour may last 5 hours. Each of these cases would be a 5-inch rain. For a longer period of time than fifty years it is likely that greater rains than 5 inches may be observed. The same is to be said if observations are to be taken over a wider area of country. In fact, a rain of 6 inches in three hours occurred near Cuba, Mo., some years since. This would increase the value of the constant from five to six, but otherwise the relation will probably remain unchanged. The importance of this law, *Science* points out, is very great in engineering, where the capacity of sewers, culverts, and bridges must be such as to carry the water. A more general investigation which Prof. Nipher is now making will determine the relation between the violence, duration, and frequency not only of maximum but of all rains. This work, when completed, will enable an engineer to construct the water-ways of bridges of such a capacity that they will probably stand a definite number of years before they are washed away. This number of years will be so determined that the interest on the invested capital during the probable life of the bridge will equal the possible damage when the destructive flood comes which the engineer determines shall destroy his work. The running expense of maintaining the bridge is then the least possible.

IN the October number of the *American Journal of Science* Mr. Lewis discusses the validity of observations on supposed glacial action at eleven points in Pennsylvania south of the terminal moraine, all of which he has visited. He concludes that they are all non-glacial, some being simple water-worn gravels, others being ice-rafted boulders, while the scratches reported in two localities are pronounced to be plant-fossils. The glacial action reported in Virginia needs, it is said, similar re-examination.

THE Meudon balloon made its third trial trip last Saturday. Starting at 12.15 noon, when a slight south-west breeze was blowing, it drifted in the direction of the Boulogne racecourse, and after arriving in the vicinity of that place, a distance of about a mile from its starting-point, obeying the motive power controlling its movement, it retraced its journey and alighted at the place from which it had ascended at one o'clock, having thus taken three-quarters of an hour to finish its trip of two miles altogether, going and coming. It is said, however, that the motive power of the voltaic elements was not quite so efficient as had been anticipated.

AT the last meeting of the Geographical Society of Hamburg, Dr. Sievers gave a short sketch of a journey of a year's duration which he intends making in the Cordilleras of Merida in Venezuela. Geographical investigation has, so far, not touched this region. Humboldt travelled through the eastern part from Cumaná to Caracas, the llanos of Caracas and Calabozo, and the districts in the Upper Orinoco, but he did not visit the Cordillera region of Merida. Later travellers also, including

Godazzi, whose work was otherwise thorough, did not reach the place. Dr. Sievers will examine the region geologically, and obtain as many measurements of heights as possible.

THE report of a journey from Seoul, the capital of Corea, to Songdo, by Mr. Aston, a consular official in Corea, has been published. The difficulties of travel in the country appear to have been much exaggerated; the people are friendly to strangers, and the discomforts are not greater than in China.

ACCORDING to a telegram from Calcutta, Mr. Griesbach, the geologist with the Afghan Boundary Commission, describes the route between Quetta and the Helmund as presenting features very similar to those in the Pishin valley and Candahar, namely, a system of precipitous, deeply eroded ridges, extending from north and south to north-east and south-west. Extensive post-Tertiary deposits fill the intervening valleys. The south-west extremity of the Ghazarband range is composed of sandstone shales and grits of the Flysch facies of Eocene rocks. A series of low hills and valleys stretch between Canjpai and Nushki, which from their composition appear to be merely continuations of the Kojah Amran range, but near Galiabah the formation is distinctly younger, the epoch being mostly trap-rock, which in places bursts through the Cretaceous limestone overlying it, and locally converts it into white marble.

NOT the least valuable of the many excellent reports published in the course of the year by the Chinese Customs department is that of the medical officers on the health of the various ports at which they are stationed. These gentlemen deal frequently with subjects of wider interest than the sanitary condition and health of certain limited portions of the Chinese Empire. Thus in the last reports, Dr. Macgowan, of Wenchow, gives an account of the cholera epidemic which visited China last year. He states, on the authority of a native author, that Indian or Asiatic cholera first made its appearance in China in 1821, medical tradition attributing its origin to the Straits of Malacca, whence it was brought to Fokhien in a junk. It subsequently spread southward to Canton, and from thence to other provinces. In 1825 a great outbreak occurred at Ch'un-Ching, on the Yangtze, and thence the disease travelled slowly northward, visiting Corea and Japan, where it became extremely virulent. It has since been endemic in China, sometimes becoming epidemic, occasionally extending over the whole of Eastern Asia, and at other times confining itself to a province or part of a province. Dr. Macgowan states that the native doctors treated the disease as common cholera, and did not cure one in a hundred; and he concludes that Indian cholera in China differs from the common cholera of the country only in its epidemic character, the former being migratory, the latter stationary.

IN the *Archiv des Sciences physiques et naturelles*, Prof. Forel of Morges has a paper on the solar corona of the spring of 1884, of which the following is a summary. In Switzerland, in the course of the present year, has been observed an extraordinary optical phenomenon consisting of a reddish corona of large diameter surrounding the disk of the sun, as well as of a reddish tint on the white clouds. This corona has been visible since the beginning of the year, and during the months of July and August it was constantly seen. Visible from high altitudes whenever the sky was clear, it was generally lost lower down, hidden probably by the light from lower layers of dust in the atmosphere. The corona is probably occasioned by dust settling in the higher layers of the atmosphere where they are protected from meteorological variations of the lower layers. This dust would be of uniform dimensions, and of a mean diameter of about 0.003 mm. In the absence of any other explanation, M. Forel refers this phenomenon to the brilliant crepuscular illuminations of last winter, and attributes these

luminous objects to the volcanic dust of the eruption of Krakatoa of August 27, 1883. In *La Nature* M. Tissandier describes the corona as observed in two balloon ascents on October 23 and 24.

M. HENRI MAGET is about to publish in Paris an atlas of the French colonies and foreign possessions. The work, which will consist of twenty-five maps, will be brought out with the assistance of eminent French colonial geographers. The maps will be of large size, in three or four colours, and some of them have obtained a silver medal and a diploma of honour, at the recent Geographical Exhibition at Bar-le-Duc. It will be completed in five parts, the first of which has already appeared. This contains maps of (1) New Caledonia, (2) Central Africa (the Congo and the Gaboon), (3) Tonquin, (4) Madagascar, (5) the Grand Duchy of Luxembourg. The second part will contain maps of Réunion, Tahiti, Guadeloupe, Senegal, and the New Hebrides.

WE have again to welcome the appearance of a new edition (the tenth) of Prof. Morren's most useful "Correspondance botanique." Since the appearance of the ninth edition (in 1881) the list of "gardens, chairs, museums, and botanical reviews and societies throughout the world," including also the addresses of all private working botanists known to the editor, has again undergone considerable enlargement—we hope an indication of a gradual spreading of interest in botanical science.

DR. BRUDENELL CARTER has issued in a separate form his now celebrated letter to the *Times* on "Eyesight and Civilisation" (Macmillan and Co.). He has taken the opportunity to introduce a few explanatory diagrams.

PROF. F. W. PUTMAN has sent to the *Leader* a full account of his recent explorations amongst the so-called Liberty Group of Mounds on the Harness estate, Ohio, first surveyed and described by Squier and Davis in 1840. In their great work on "The Ancient Monuments of the Mississippi Valley" these archaeologists describe five small mounds within the great square of twenty-seven acres. Most of these, as well as three others represented on their plan just outside a "gateway" on the east side of the larger forty-acre square have been much reduced by cultivation. All have now been carefully examined, two—evidently burial-places—yielding objects of considerable interest. The human bones were much decayed; but amongst the other finds were copper plates, ear-rings, and celts, slate and stone ornaments, some large beads covered with copper, and in one instance with silver over the copper, and many other objects, all of which have been deposited in the Museum of Cambridge University. In another large mound north of the same spot an extensive bed of ashes and charcoal yielded much pottery, pieces of cut mica, some grass matting with charred seeds, nuts, acorns, and bones. Near the eastern corner of the great square stands the largest mound of the whole group, which in future Reports of the Peabody Museum will be referred to as the "Big Mound of the Liberty Group." It is 160 feet long by 80 to 90 wide, and 13 to 18 high, and appears from the portion so far examined to be a burial-place of a remarkable character. Some 40 feet from the centre, at the northern end, twelve chambers were opened, and yielded charred mats and cloth in which the bodies had evidently been wrapped, besides various burnt objects, such as copper plates, ear-rings, shell beads, and long flint knives. In two of the chambers skeletons were found stretched at full length, with a copper plate on one of them, the action of which had preserved the structure of a finely-woven piece of cloth. In the other chambers the bodies had been burnt on the spot, as shown by the relative position of the bones and by the fact that in two instances portions of the bodies had fallen beyond the fire, and so escaped burning. Other discoveries made early in the present year in two of the pits by some boys, under the guidance of

Mr. Wilson, yielded a great variety of objects which have also been secured for the Peabody Museum. Important links have thus been obtained between the builders of this great mound and neighbouring earth-works in the Scioto Valley and the constructors of the remarkable group on the Turner estate in the Little Miami Valley.

MR. ELLIS, of 90, New Bond Street, has now on exhibition a number of garments, fur-lined and fur-covered, which were used by the German Polar Expeditions of 1882. In both cases the furs were hardly worn at all. The first expedition, which wintered from August 21, 1882, to September 12, 1883, in Kingawa Fjord, Cumberland Gulf, 60° 15' W. longitude and 60° 36' N. latitude, and as there was a perfect calm through the winter, the furs were not necessary; similarly the second expedition, which wintered in the island of South Georgia (36° 5' W. longitude and 54° 32' S. latitude) from August 21, 1882, until September 5, 1883, found the temperature equally mild. The furs were lent for exhibition by the Imperial German Polar Commission.

THE last census of Roumania gives a total population of 4,424,961, of which 2,276,558 are males, and 2,148,403 are females. According to religious sects there are 4,198,664 orthodox Greeks, 134,168 Jews, 45,152 Roman Catholics, 28,903 Protestants, 8734 Gregorians, 8108 Armenians, and 1323 Mohammedans. The foreign element in the population is composed as follows:—28,128 Austrians, 9525 Greeks, 3658 Germans, 2822 English, 2706 Russians, 2631 Turks, 1142 French, 167 Italians, and 539 of various nationalities—in all 51,138 persons. The urban population numbers only 781,170, while the rural population is 3,643,783.

ON October 16 a mirage was seen at Lindesberg, in Central Sweden. It represented a large town with four-storied houses, a castle, and a lake. The phenomenon was observed for about fifteen minutes.

THE red sun-glows have recently been observed in the far north of Sweden.

THE additions to the Zoological Society's Gardens during the past week include a Barbary Ape (*Macacus inuus*) from North Africa, an Anubis Baboon (*Cynocephalus anubis*) from West Africa, a Siamese Blue Pie (*Uroecissa magnirostris*) from Siam, presented by Mr. R. B. Colom; a Ring-tailed Coati (*Nasua rufa*) from South America, presented by Mr. C. M. Courage; six Alexandrine Parrakeets (*Palæornis alexandri*), a Blossom-headed Parrakeet (*Palæornis cynocephalus*), a Banded Parrakeet (*Palæornis fuscicatus*), from British Burmah, presented by Mr. Eugene W. Oates, F.Z.S.; two Ring-necked Parrakeets (*Palæornis torquatus*) from India, presented respectively by Mr. W. G. Burrows and Miss Perry; a Weka Rail (*Ocydromus australis*, white var.) from New Zealand, presented by Mr. J. Satchell Studley; a Brown Capuchin (*Cebus fatuellus*) from Guiana, two Pronghorn Antelopes (*Antilocapra americana* ♂ ♀) from North America, deposited; a Great Grey Shrike (*Lanius excubitor*), six Curlews (*Numenius arquata*), British, purchased; a Blue-winged Teal (*Querquedula cyanoptera* ♂) from South America, received in exchange.

#### VARIATION OF THE ATOMIC WEIGHTS

THE annexed list contains all the elements except a few very little investigated. If the whole numbers in columns are taken to be each the weight of nine atoms in the gaseous state, and a comparison is made with the best determinations of vapour-densities on record, the result is as follows. The first nineteen determinations are Deville and Troost's, and are to be found in *Comptes Rendus*, xlv. (1857) p. 823; lvi. (1863) p. 893; lx. (1865) p. 1222; lxiii. (1866) p. 20.